

Signal Development and Coupling to Readout Electronics

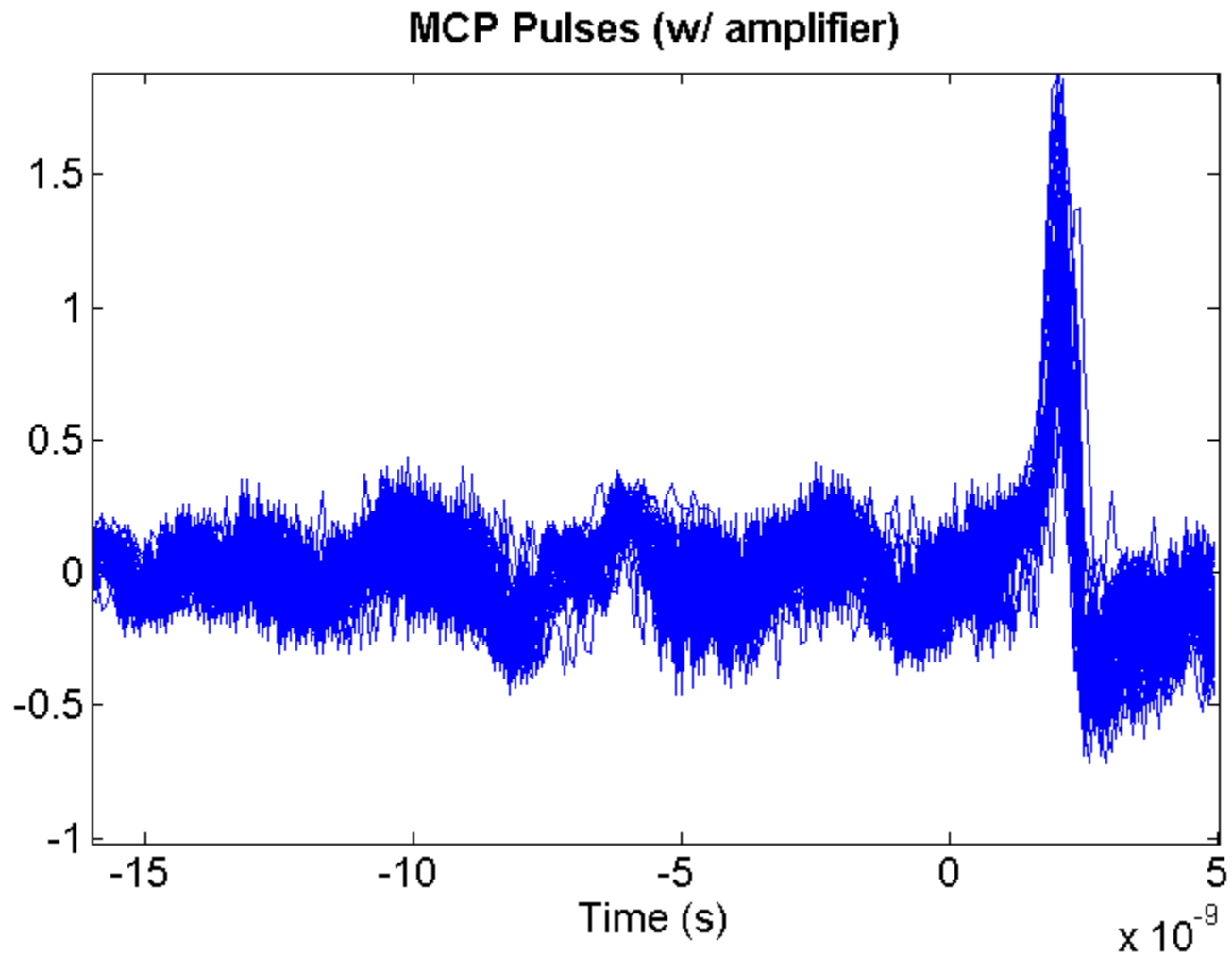
Razib Obaid, Herve Grabas, Rich Northrop, HF

Outline of the talk

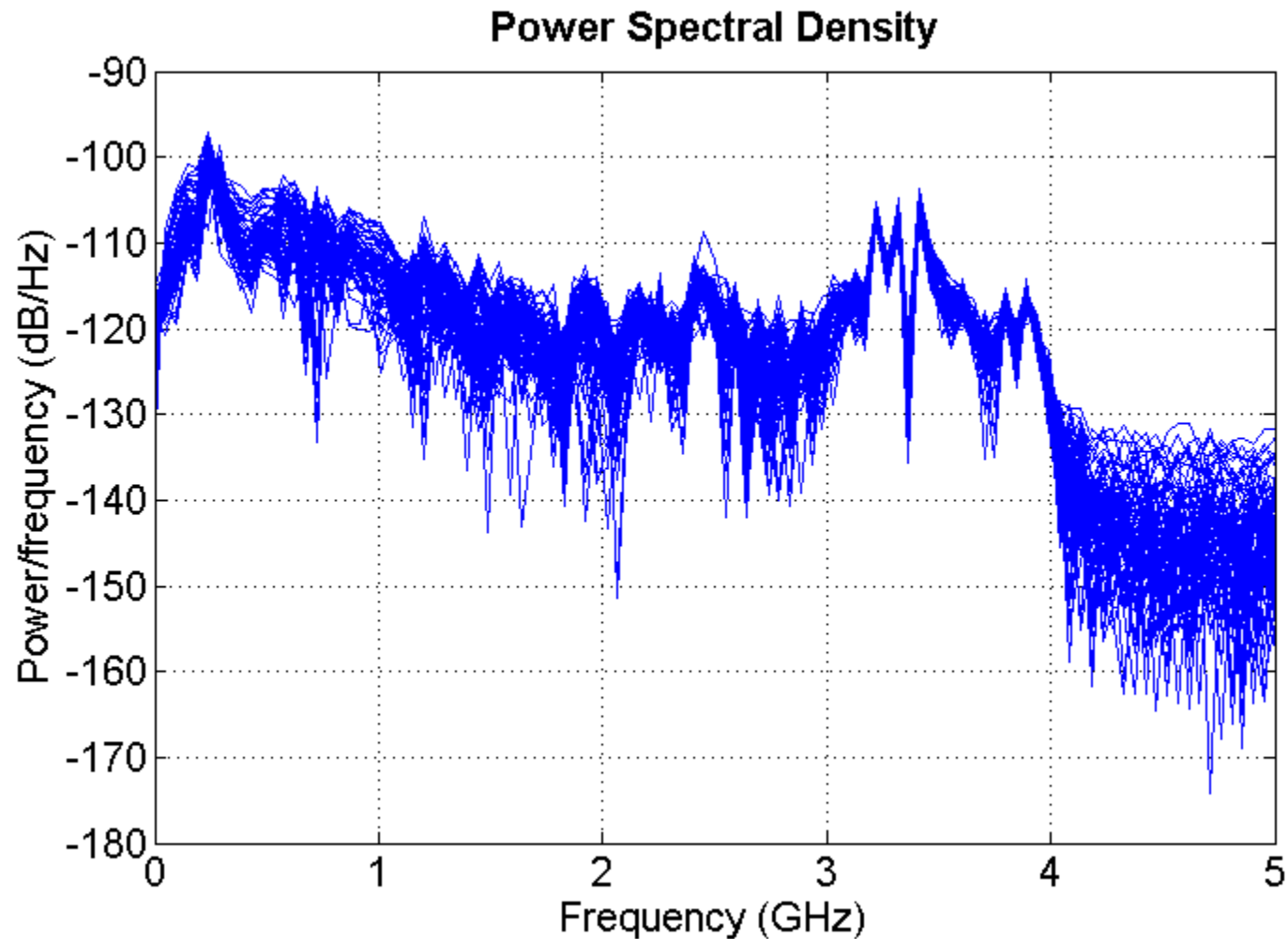
- ▶ MCP signal characteristics
- ▶ Anode design and signal integrity
- ▶ Connectors
- ▶ Publication highlights

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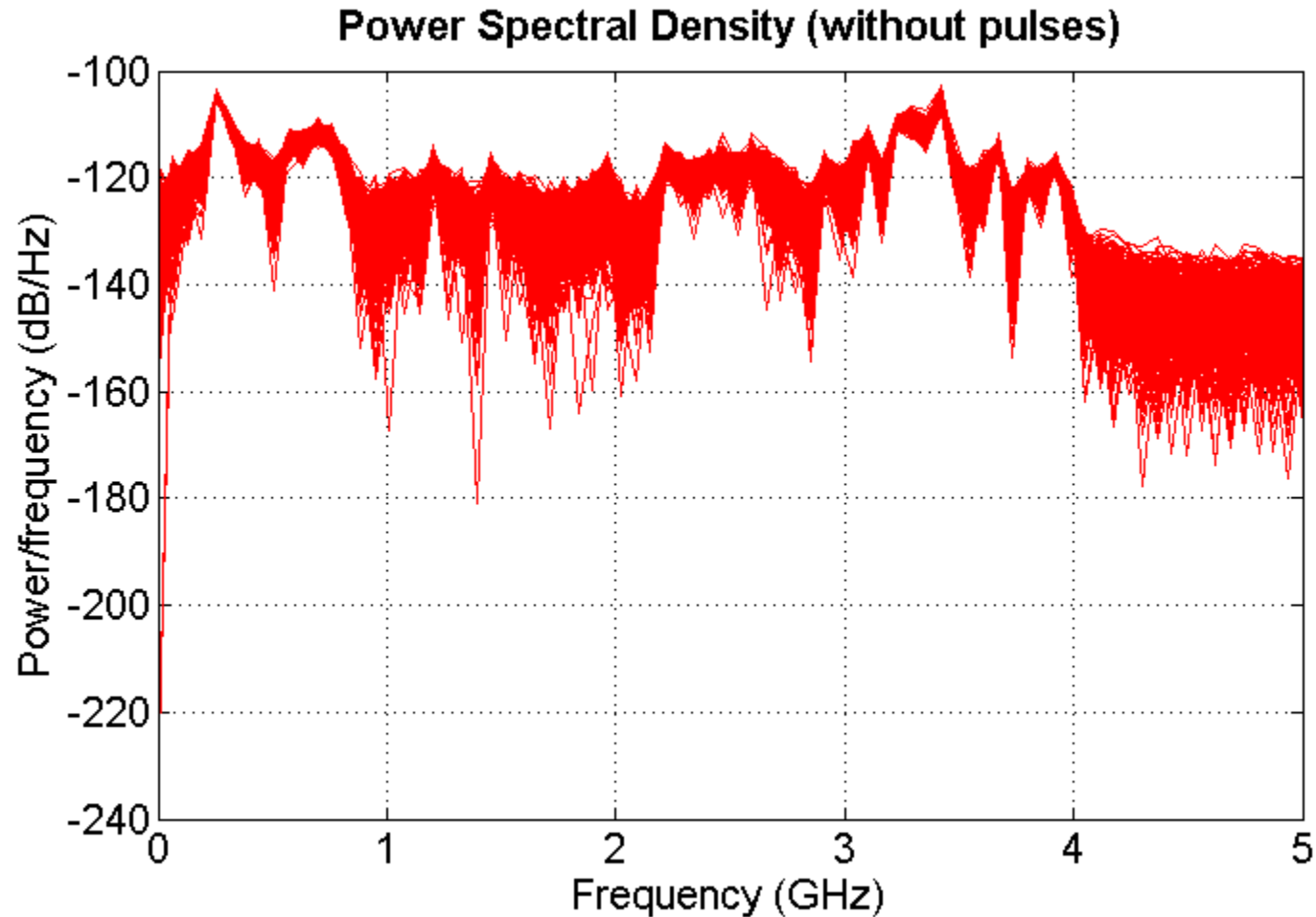
MCP Signal



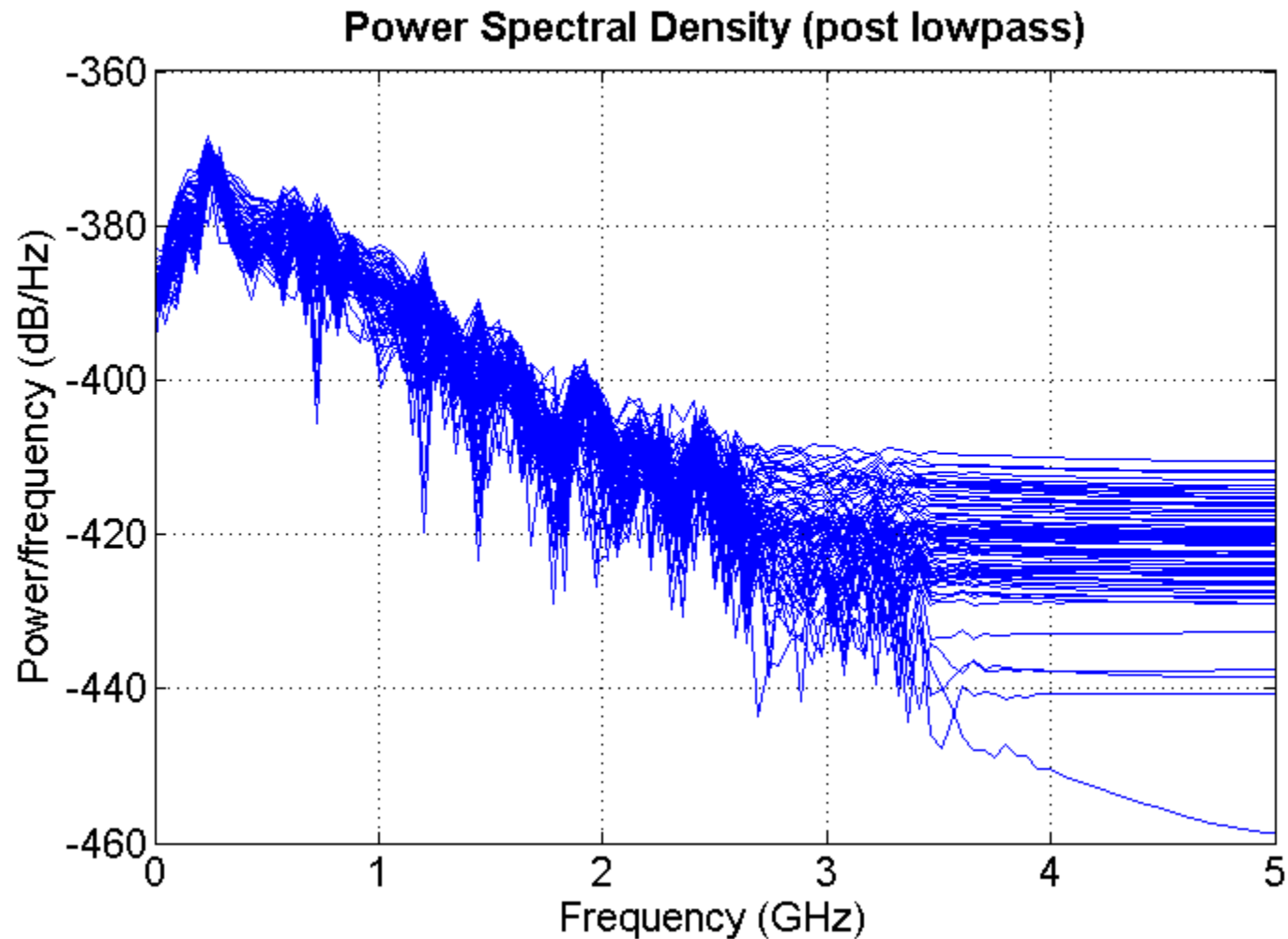
Frequency component of the signal



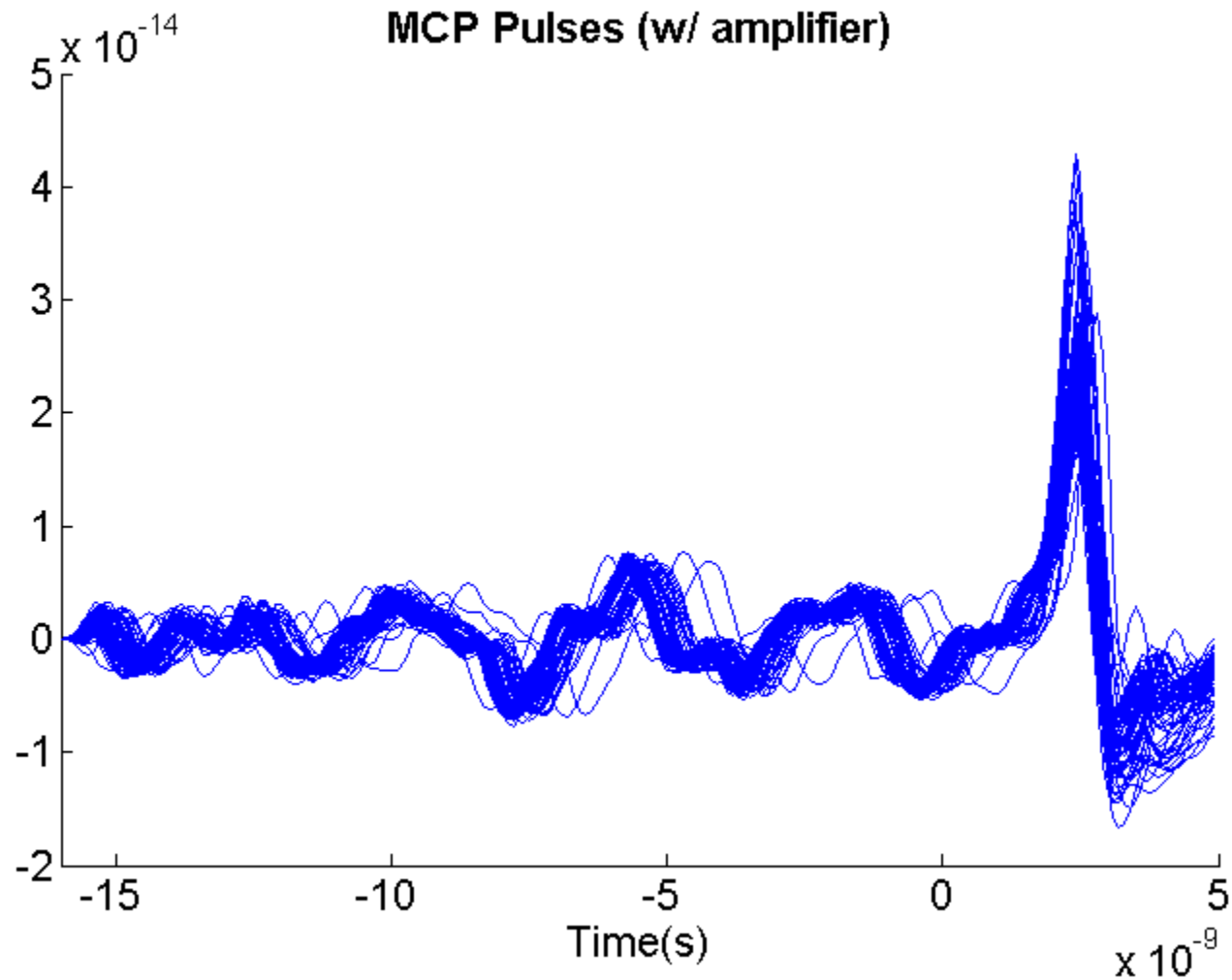
Frequency component without pulses



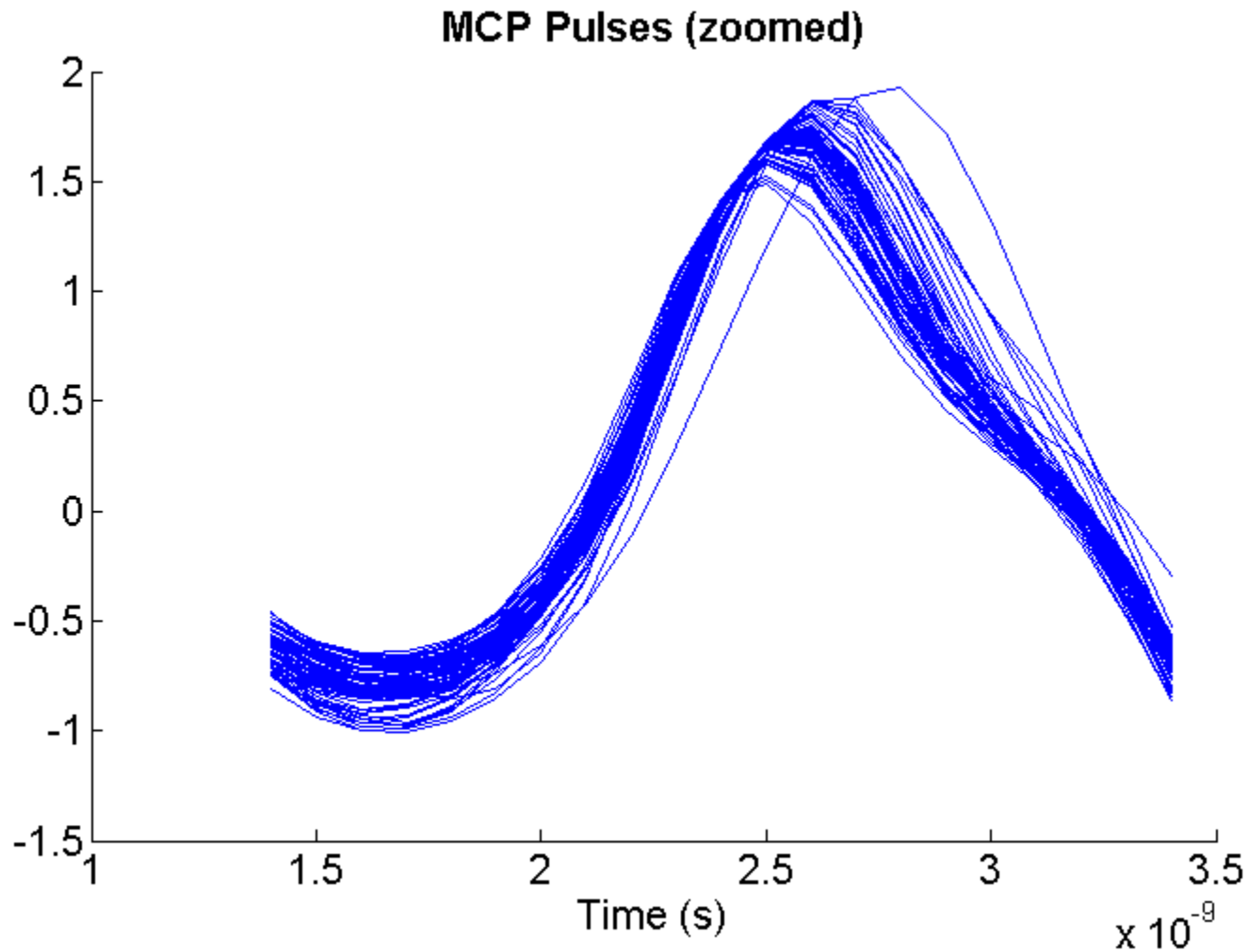
After lowpass of 500 MHz



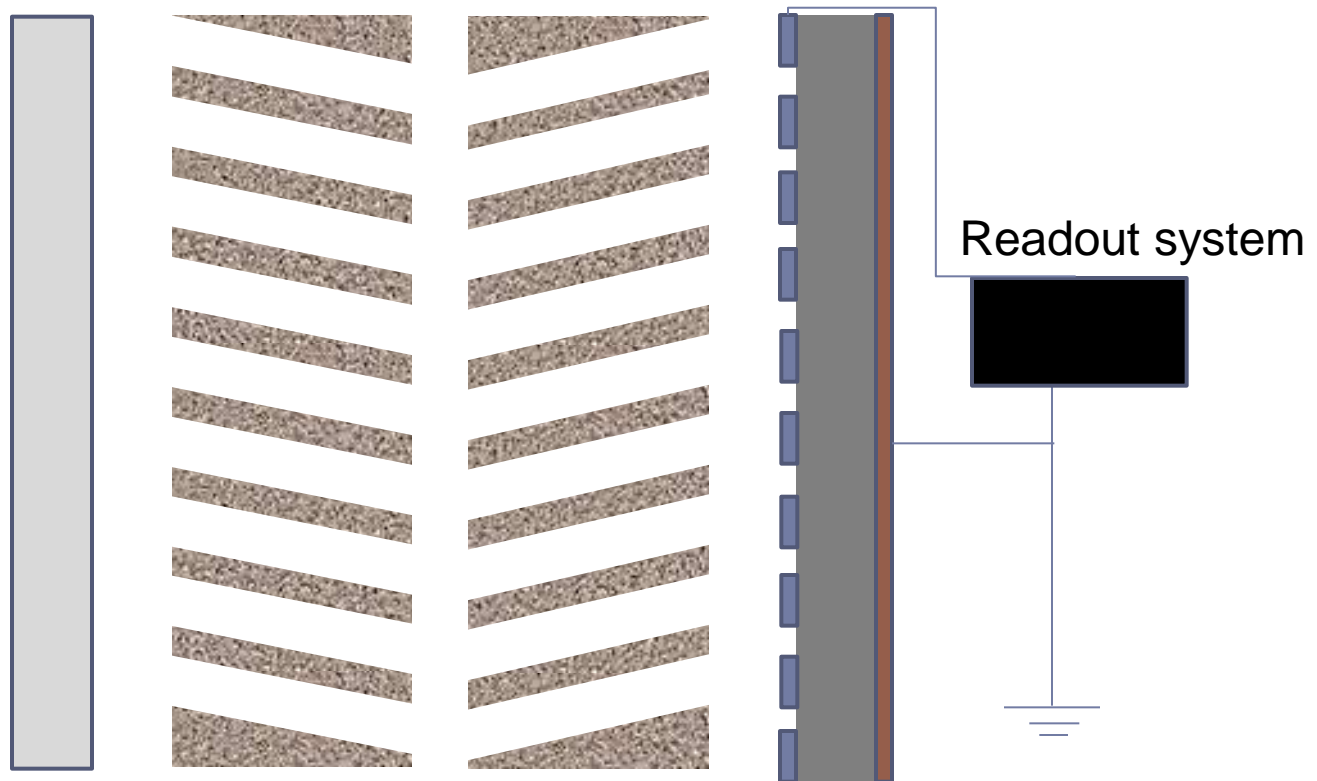
Pulses after lowpass



Removing Pockels cell noise



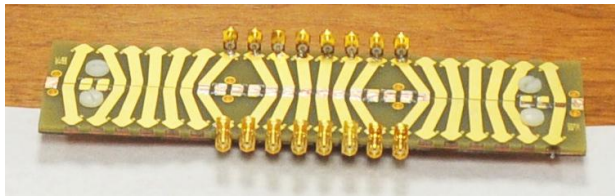
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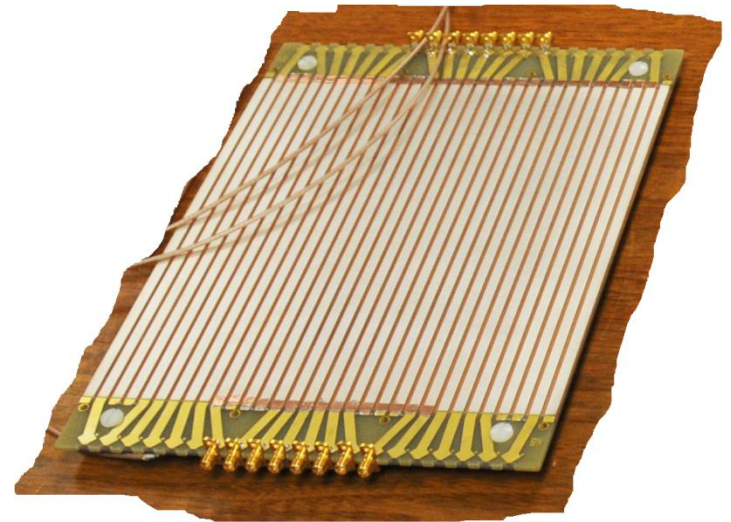
- Borofloat® 33 glass as substrate.
- Silk-screened silver-ink strips
- Fan-out card made of FR4 on each end.
- Glass with strips make up a 'tile'
- Each tile is 9.02" x 8.66"



30 Strips	40 Strips
Width = 0.182"	Width = 0.148"
Spacings = 0.09"	Spacings = 0.052"



Fanout (Zero tile)

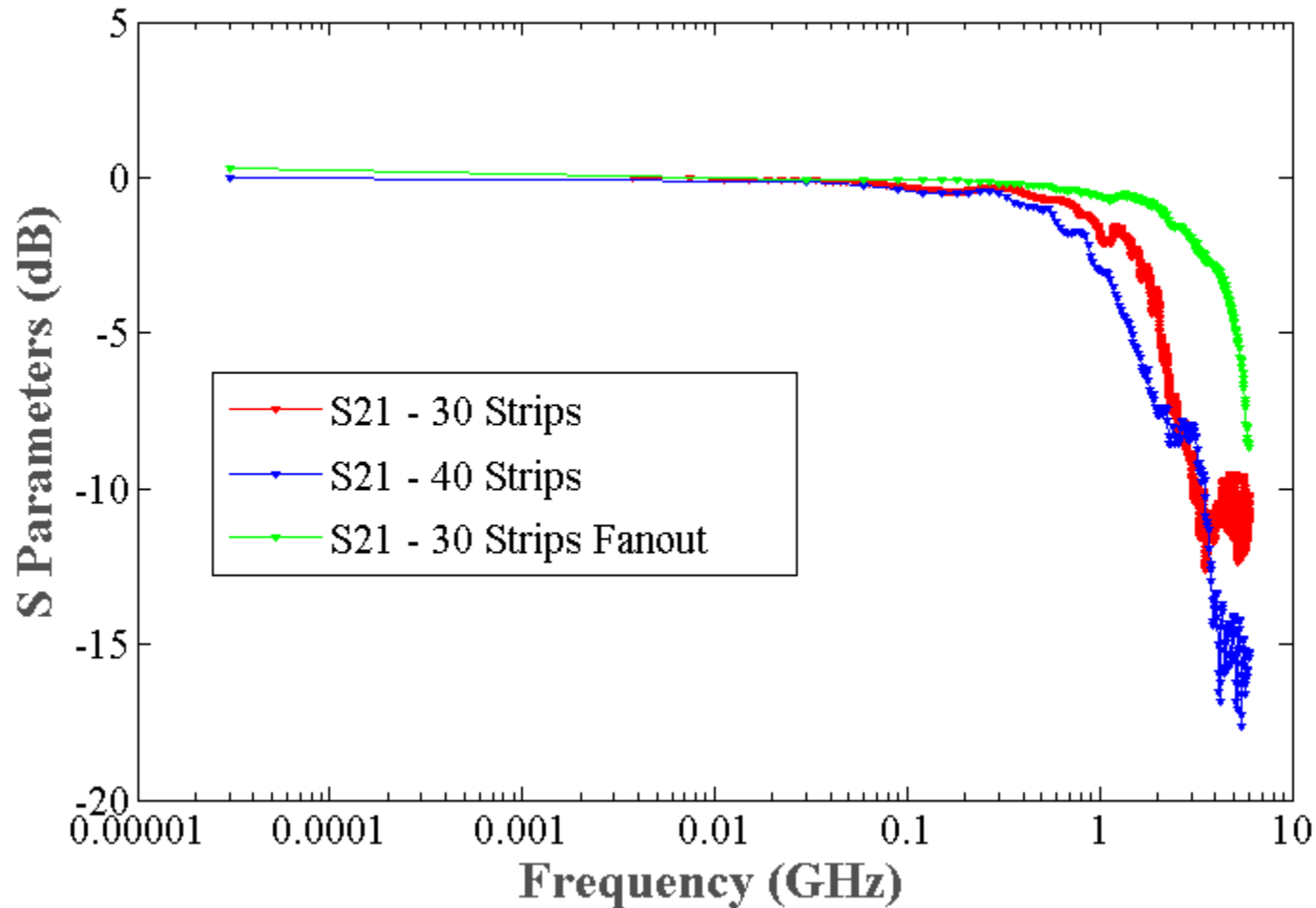


One tile

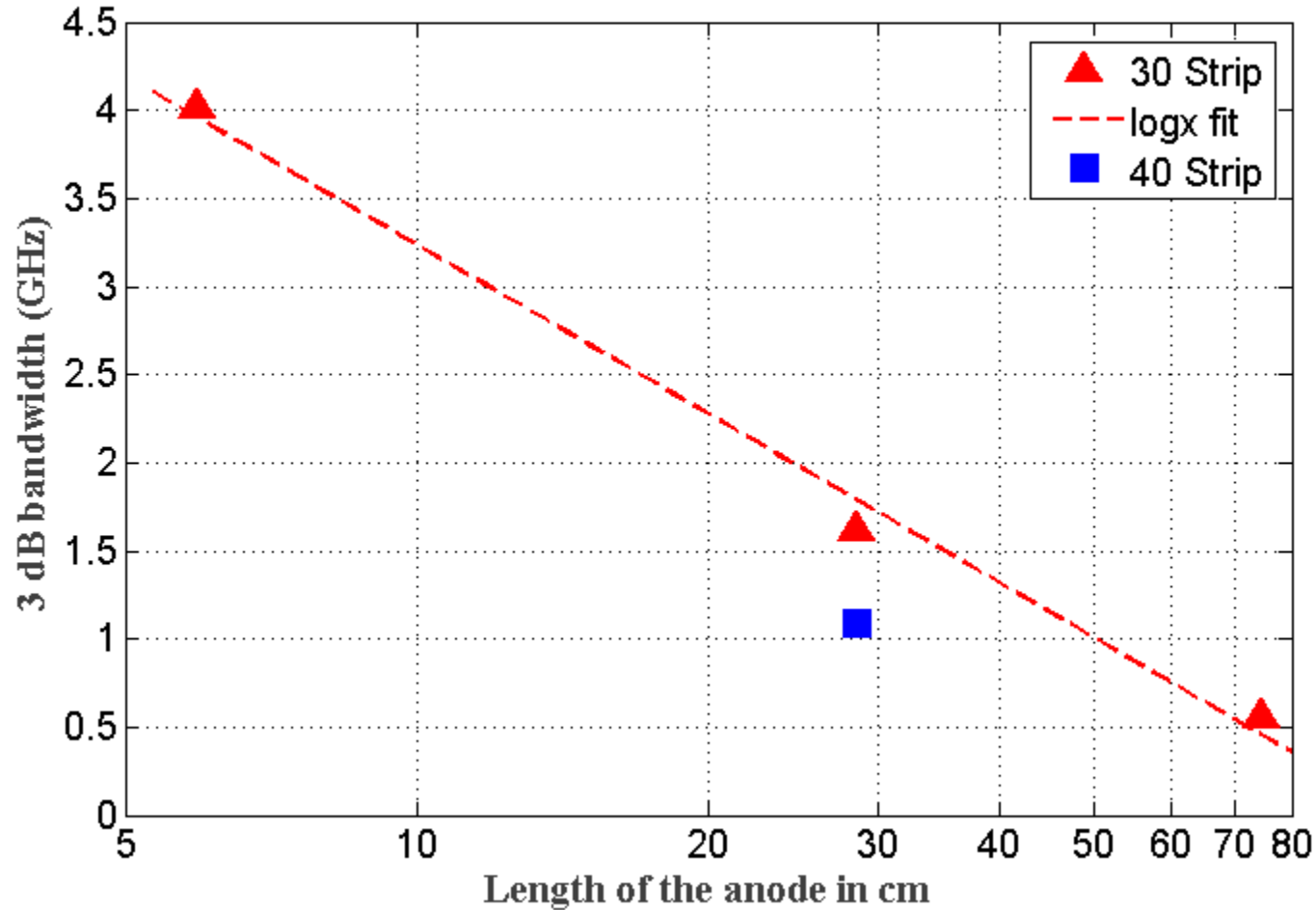
Three tiles



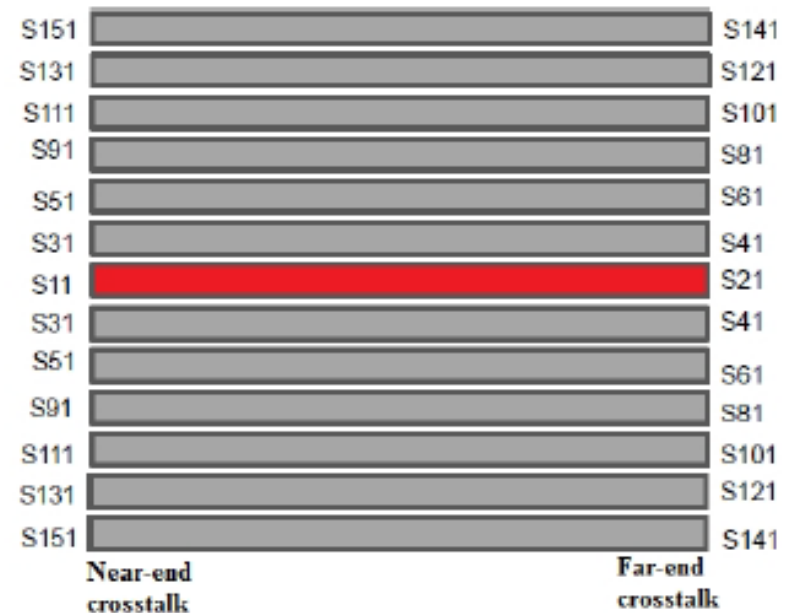
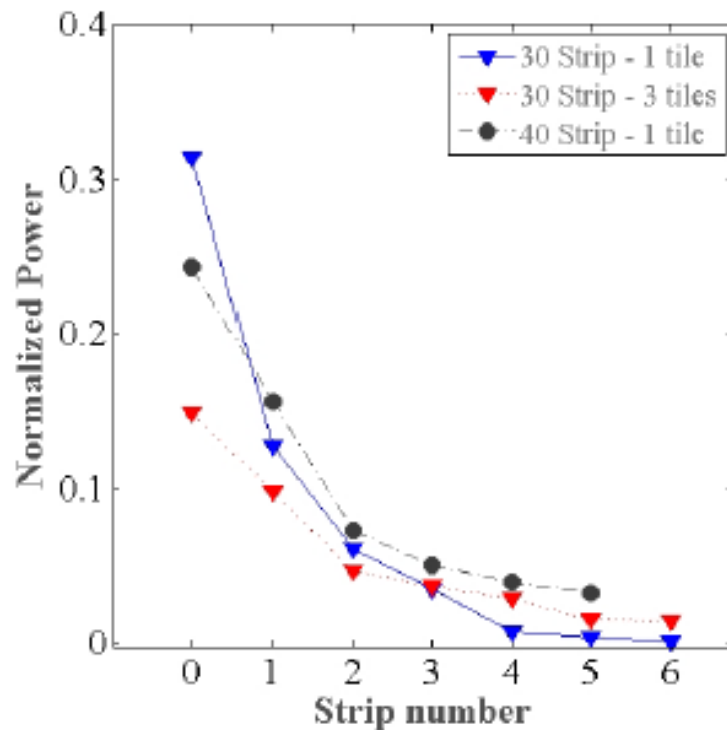
Transmission loss (S21) of a single tile



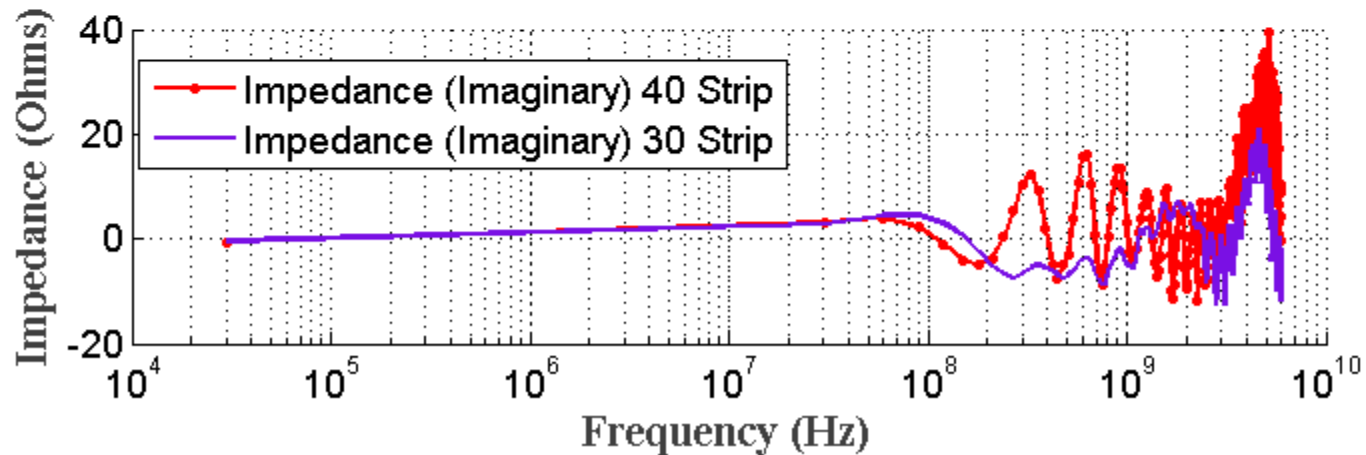
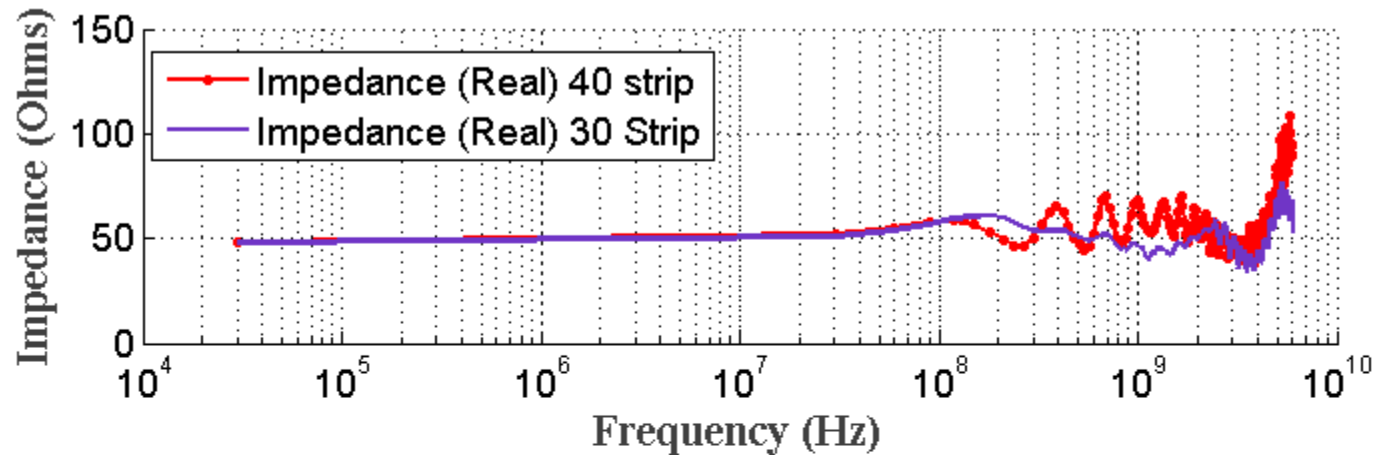
Bandwidth (*)



Crosstalk (*)



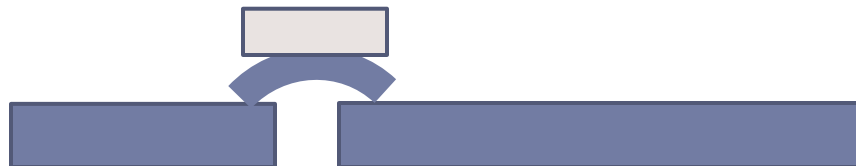
Impedance (*)



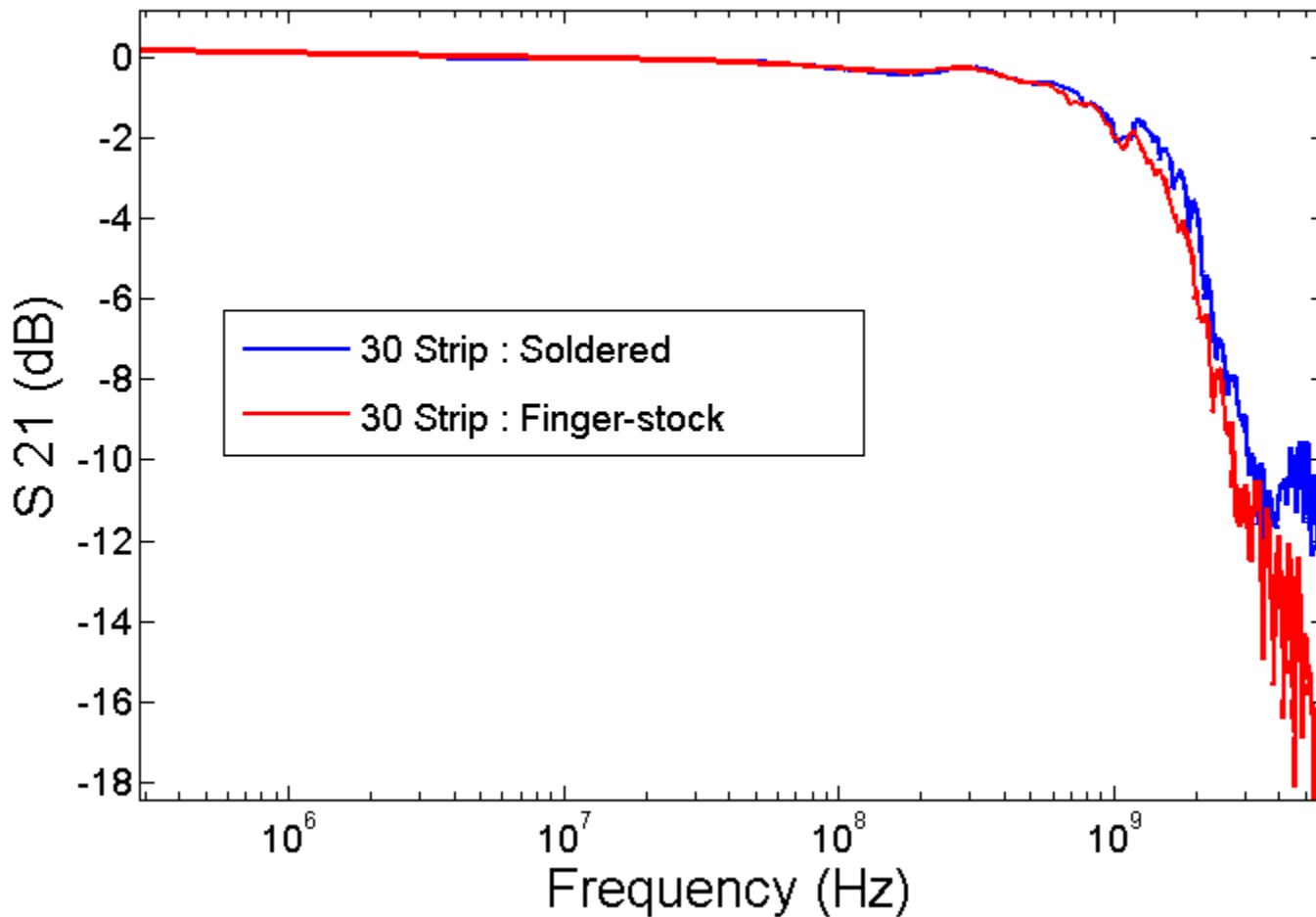
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Connectors

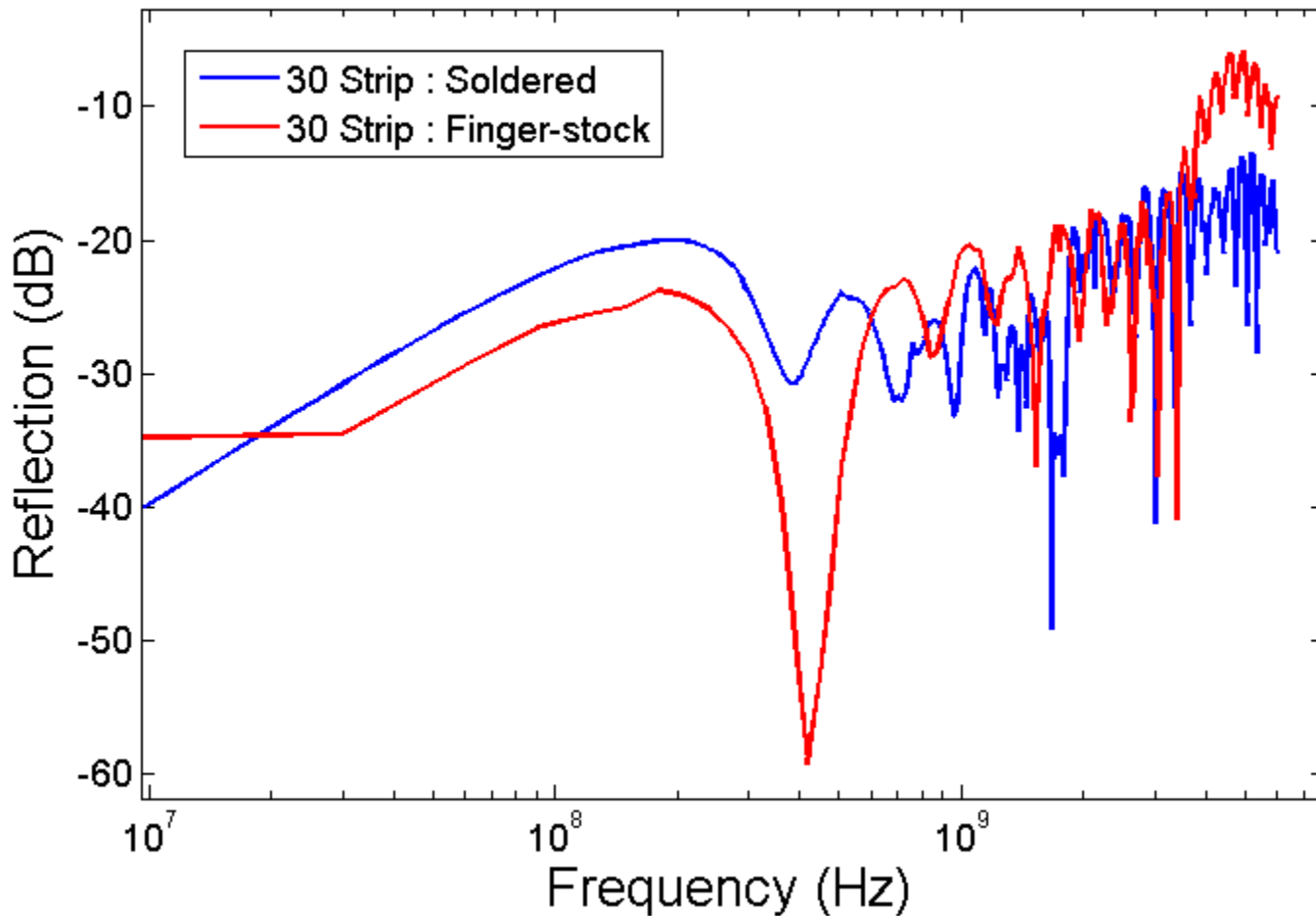
- ▶ Anodes were previously connected to the fanout card and to each other to form a longer assembly using paste silver solder.
- ▶ Currently, it is connected using Copper-Beryllium Fingerstock.



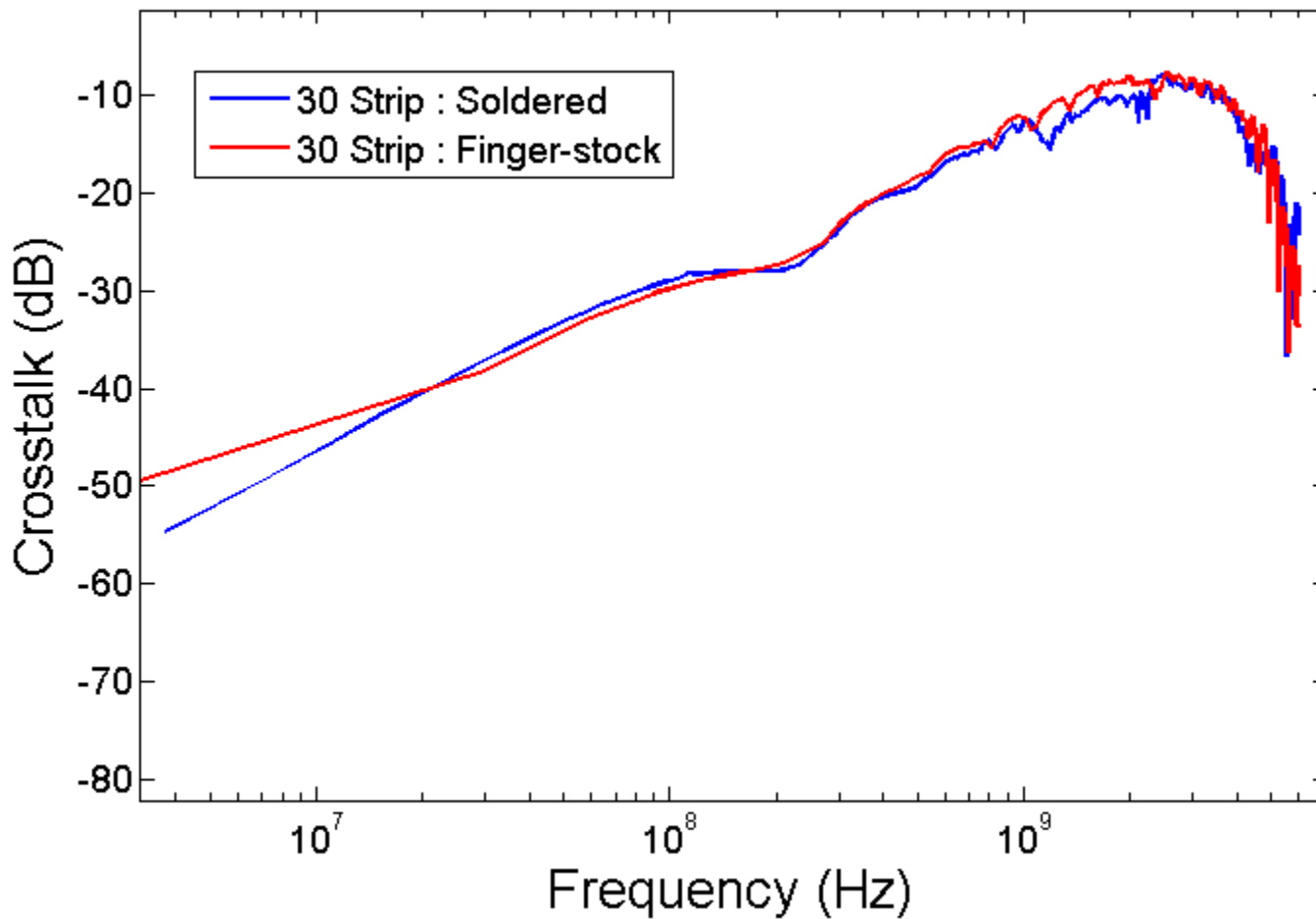
Transmission vs Frequency

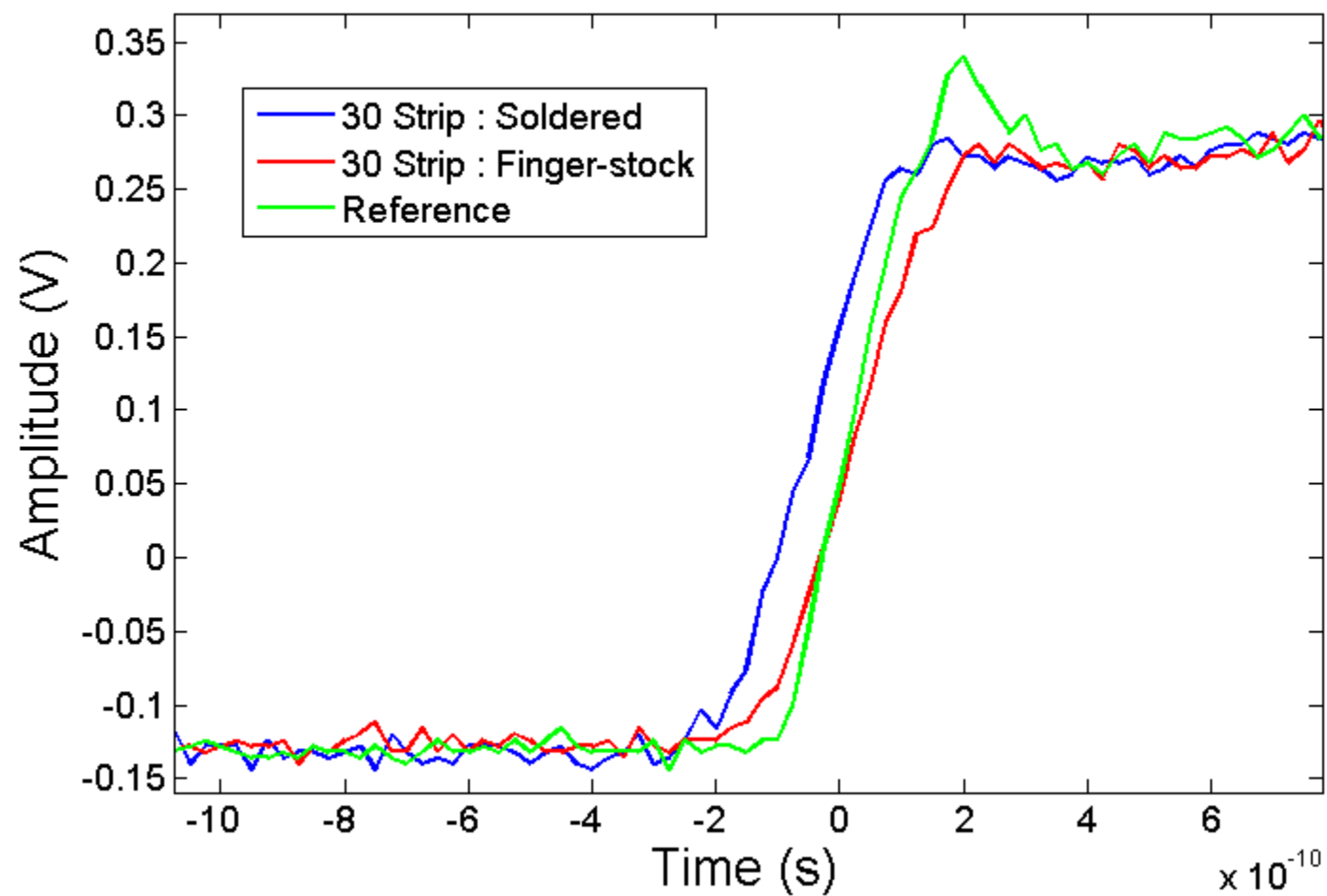


Reflection vs Frequency



Crosstalk





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- ▶ The current draft is titled 'RF Strip-line Anodes for Psec Large-Area MCP based photodetectors'.
 - ▶ It contains the measurement of bandwidth, crosstalk power in the neighboring striplines, impedance, signal propagation speed.

Type of anode	Risetime (ps)
30 strip fanout	87.2
30 strip silver-screen tile	217.2
40 strip silver-screen tile	317.9
3 - 30 strip tile	622.2

Abstract

We have designed and tested economical large-area RF strip-line anodes with analog bandwidths in the range 0.4-1.6 GHz for use in MCP-based photodetectors to provide measurements of time, position, integrated charge, and pulse waveform shapes. Measurements of the anode impedance, bandwidth and cross-talk due to inter-strip coupling are presented for two anode stripline patterns.

along the strips. The anodes used here have a nominal impedance of $50\ \Omega$ and a measured propagation velocity of $0.565 \pm 0.007\ c$ (169 ± 21 microns/psec). The correspondence between the time resolution on the pulse at one end of the strip (δt) and the position resolution (δx) is given by

$$\delta t = 1/2\ \delta x. \quad (1)$$

And others...

